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Could distributed curriculum improve the ITBS scores of non-proficient students?

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Could distributed curriculum improve the ITBS scores of non-proficient students?

Abstract

Will the use of a distributed math curriculum improve the outcomes of students who consistently score between the 20th and 30th percentile on ITBS tests? That question and others are addressed in this paper. The purpose of this study was to determine what strategies were being used for math instruction, if those strategies were working for all students, and whether a distributed curriculum would improve the math outcomes of students with disabilities who were not working at their current grade level.

**Could Distributed Curriculum Improve the ITBS Scores of Non-proficient
Students?**

**Submitted
In Partial Fulfillment
Of the Requirements for the Degree
Master of Arts in Education**

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University of Northern Iowa
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Introduction

As a result of the passage of the No Child Left Behind (NCLB) law, schools across the nation are looking for strategies to improve student outcomes and move all students to levels of proficiency in reading and math. As faculty members around the nation implement new strategies, they collect data to find the best practices to successfully accomplish all proficiency goals. Whatever the strategy, it is of considerable importance to teach the strategy, collect data as the strategy is used, and use the collected information to improve the outcomes of all students in all areas. The accumulation of such data will help all teachers to know which strategies work and which do not work or which strategies work for a particular child and which do not. This will make instruction more personal for the students who need to “make the grade.” It will also allow teachers to establish a time frame for the progress of individual students, inform teachers which students are not making satisfactory progress, allowing the teachers to intervene with a different strategy that is more appropriate for that particular student. This will allow teachers to do what we all want to do: give students what they need in order to be academically successful.

One of those strategies is the distributed curriculum. This is especially beneficial for students who are having difficulty; they get information in small doses that can alleviate the anxiety and frustration that struggling students so often feel. It also gives them a chance to receive the new information more than once, so there is no anxiety about “getting it the first time.” Distributing the curricular material allows students to process and understand more information when they are given the information the

second, third and fourth times, and can improve retention since students are more engaged during the shorter instructional time.

Will the use of a distributed math curriculum improve the outcomes of students who consistently score between the 20th and 30th percentile on ITBS tests? That question and others are addressed in this paper. The purpose of this study was to determine what strategies were being used for math instruction, if those strategies were working for all students, and whether a distributed curriculum would improve the math outcomes of students with disabilities who were not working at their current grade level. If students with disabilities were able to improve their math outcomes with the use of a distributed curriculum, it would seem to indicate that this type of instruction would also work for those students who are not identified for special education, but who are not reaching the set minimum level of proficiency.

A small percentage of students are not reaching the expected levels of success with the current instructional strategies. It seems likely that there is a need for different strategies for these students, perhaps strategies that address their learning needs as individuals. We know that students are different and learn differently. We also know that not all students are successful. Their lack of success could indicate they need different strategies that relate to their specific individual needs. Students who are struggling have different needs, and those needs require different instructional strategies. Just as one size fits all rarely works in clothing, one teaching strategy does not work for all students in education. If the stated goal of the U.S. education system is “no child left behind”, then the single thing required of educators is the versatility to successfully instruct children of every skill level.

As more and more schools are facing the dilemma of students who are not proficient in the areas of reading and math, the importance of finding the right strategies for each student becomes more and more significant to the everyday learning process. The strategies that will enable each student to be successful are as different as the students themselves; therefore, teachers will need as many strategies as they can get in order to meet the needs of all students. The study of the use of a distributed curriculum as a strategy to improve the outcomes of students below the proficiency level could benefit all teachers who teach those students. If there is evidence of success in using the distributed curriculum to improve the outcomes of struggling math students, then possibly the distributed curriculum could improve the outcomes of all students in many areas.

This study faced several limitations. Time was a limiting factor in two ways. First, the interviews with the 4th grade teachers were conducted in a reflective way, asking them to think back about last year's curriculum and the strategies they used. Second, time also limited the data collected as the distributed curricular strategy was used for data collection for only 9 weeks. A longer period of time might have given a different outcome. Third, a major limitation is the fact that only two students were involved with the concept of distributed curriculum. There could also have been different outcomes if a larger number of students were included, and if those students were not students identified for special education. In this particular study there were two students participating in a special education pull out program, providing valuable data from their own unique cases. Data from regular education students could have yielded different results.

Literature Review

Professional development, collaboration, and improved student outcomes have become the key focus in education with the passage of the No Child Left Behind law. Providing teachers with the appropriate tools so they can make the right instructional decision for all students is necessary in the current educational climate. Teachers must know what instruction to provide and how to best provide it. They also require the intuition and observation skills to realize when instructional strategies are not working so they can provide alternate methods of instruction, enabling every student to succeed. Only through on-going professional development can teachers hone the precise skills they need to meet the high demands of today's educational requirements.

Professional development must be accompanied by collaboration. Teachers need to share ideas, experience, and knowledge with each other to weave a support system that leads to success for all students. Collaboration provides a safety net for teachers who are often faced with making daunting decisions in regard to curriculum and instruction that can tip the scale one way or the other in regard to student success. Collaboration, although crucial to improving student outcomes and the development of successful learning communities, is not as easy to implement as one would like. Scheduling problems and ineffective collaboration are just two of the problems faced by administrators as they work to develop the model that works best for the students and teachers under their direction.

Professional development and collaboration are the stepping-stones needed for teachers to reach the necessary level of expertise to provide each student with what they

need to be academically successful. Using these methods, teachers can learn and share multiple instructional strategies that can be implemented in classrooms to meet the needs of all students creating the optimum-learning environment. As the classroom becomes more ethnically, culturally and instructionally diverse, teachers need to be armed with more strategies to meet the needs of each child.

Needs

In order for no child to be left behind, educators and administrators must make some changes. According to Parmar and Cawley (1997) “for teachers involved in making broad choices about what is to be taught or who has to make a multitude of decisions about content and instructional procedures to meet the needs of a diverse group of students the answer rests in professional development.”(p.188). Professional development would help teachers to, “teach math well to students with differing abilities which seems to be much more important than having math teachers who possess strong backgrounds in mathematics” (Baker, Gersten and Lee, 2002, p.51). If professional development provided teachers with multiple strategies “to balance different instructional approaches”(Baker, Gersten & Lee, 2002, p. 52) in the classroom, then the needs of all students would be met leaving no child behind. In the face of data-driven, best-practice education, teachers must be given the support of quality professional development to possess the new and improved skills and strategies they need to help every child to be proficient in all areas of study.

If administrators could facilitate changes that would allow teachers time for professional development that would provide teachers to collaborate with new strategies,

perhaps no child would indeed be left behind. In light of federal mandates related to the NCLB law, collaboration has become a very important component in today's educational setting. Without collaboration amongst teachers within a building, the demands, decisions, and responsibilities faced by each teacher in regard to the success of each student is daunting. Making such important educational decisions in isolation is overwhelming as well as frustrating. Joseph and Hunter (2000) recognize that "collaboration fosters a sense of shared responsibility for educating heterogeneous groups of students" (p. 125). In view of what Hunter and Joseph have to say regarding collaboration, it stands to reason that whether collaboration comes in the form of common planning time when teachers can dialogue ideas, plans and themes, or in co-teaching, where teachers share instructional responsibilities, the "outcome would be enhanced quality of education for all students as they attain higher levels of problem solving, reasoning, communication, connections, and efficiency..." (Parmar and Cawley, 1997, p. 189). "The increasing necessity of professional collaboration underscores the importance of accurately gauging its success, particularly in light of mounting pressures in schools for personnel to be more accountable for student outcomes" (Gable, Mostert, & Tonelson, 2004, p.5). Parmar and Cawley (1997) also indicate that "considerable collaborative effort is needed to develop solutions to the differences in curricular, instructional and assessment perspectives" (p.5). Although research has proven the need for collaboration to improve the success rate of students, teachers' daily schedules often do not allow for collaboration. Nor are there clear guidelines for documenting the effectiveness of the collaboration in regard to improving student outcomes (Gable, Mostert, & Tonelson, 2004). Collaboration can exist of a micro scale among members

of the same faculty or school district or it can exist of a macro scale with teachers from other schools attending workshops and in-services for the sharing of ideas and strategies that have been successful. Although collaboration amongst teachers within the school, whether in grade level teams or departmental teams, is advantageous to student outcome, collaboration on a larger scale has also proven beneficial (Parmar & Cawley, 1997). Collaboration is also important to break feelings of isolation and help to create a learning community that is responsible for ensuring the success of all students.

Research done by Baker, Gersten, and Lee (2002) indicate “that different types of interventions led to improvements in the mathematic achievement of students experiencing mathematics difficulties” (p.51). Research supports the need for multiple modes of instruction for the struggling student. In order for low achieving students to succeed and improve in math they must be actively engaged in the learning process, maintain focused involvement in the learning process, and help to appropriately use the strategies they have been taught (Baker, Gersten, & Lee, 2002). What keeps the student actively engaged and involved in the learning process is as different for each student as each student is from one another. When attempting to discern how to best meet the needs of struggling math students, the National Research Council has suggested that “high quality research should play a central role in any effort to improve mathematics learning” (Baker, Gersten, & Lee, 2002, p. 68). According to the National Research Council, the research may not solve the problems, but it will help teachers to design the best practice instruction to use for their particular students (Baker, Gersten, & Lee, 2002). The more that is known about any strategy, the better it can be used effectively.

Strategies

The importance of using research-based best-practice instruction is well founded; however, to make the most of the best-practice instruction teachers must know their students and implement the proper strategy for the needs of each particular student. This awareness of student needs “may result in learning strategy instruction that is appropriately tailored to individual needs”(Joseph & Hunter, 2000, p. 124).

As with all areas of education, the way math has been taught is going under a change. In recent years math instruction has changed from rule based instruction to a more constructivist learning approach. Students are now expected to construct their own mathematical knowledge. Rather than teachers showing the students the strategies to use to find solutions, students are now guided to the answers through their own reflective thinking. Although this works well for average and above average students, it may not be the best type of instruction for low achieving math students (Baker, Gersten, & Lee, 2002; Milo, Seegers, Ruijsenaars, & Vermeer, 2004). Direct explicit instruction has been shown to work better for low-achieving students than the currently more popular real-life contextualized instruction. It appears that these students need a step-by-step map to follow in order to master math concepts rather than struggling to solve higher level thinking problems in a constructivist manner (Baker, Gersten, & Lee, 2002; Bottge, Heinrichs, Mehta, Hung, 2002; Montague, Van Garderen, 2003; Joseph & Hunter, 2001). The use of checklists or cue cards can help students correctly implement the strategies they learn during direct instruction (Margolis and McCabe, 1997; Joseph & Hunter, 2001). The use of cue cards or checklists has been shown to improve student scores even after the cards are removed (Uberti, Mastropieri, & Scruggs, 2004; Margolis & McCabe,

1997). The data shows that these low-level students are capable of handling the information, but it must be presented in the correct manner for them.

It is very important for low achieving students to receive regular feedback so they will know what they are doing correctly or how to change their incorrect strategies. Computer programs have been valuable in allowing struggling students to solve problems in target areas where more practice is needed and receive immediate feedback (Baker, Gersten, & Lee, 2002). It is also important to constantly graph students progress. This information helps both the students and the teacher. The students can see their progress, while the teacher can consistently see if the strategy being used is working or if there is a need for a new intervention. By regularly graphing student performance, changes in instruction can be made in a timely fashion so there is no loss of valuable instruction time for students who are already straggling behind their peers (Baker, Gersten, & Lee, 2002). Students who are already low achieving need nothing less than for teachers to spend months on unproductive strategies leaving them still farther behind.

Peer-assisted learning as an intervention for low achieving students has been relatively successful. Baker, Gersten, and Lee's (2002) research has concluded that "peer-assisted learning approaches demonstrated a consistent, moderately strong positive effect on the computation abilities of low achievers" (p. 66). Low achieving students are often insecure in their abilities to successfully complete their assignments. Having a peer to answer questions or suggest solutions can increase the confidence of the struggling student. The help of the peer may also improve the amount of time a student will spend on the assignment, which is a recurring problem for struggling students. Many students who exhibit problems in math do not demonstrate a high degree of task persistence. The

use of peer assistance could improve the degree to task persistence thereby improving the math outcomes of these students. Support and feedback given by peers is likely to improve problem solving and computational abilities of struggling learners. (Margolis & McCabe, 1997; Baker, Gersten, and Lee, 2002).

When students display difficulties with math, teachers often focus on teaching them the basics. According to Larry Bell (2003), this is part of the problem, not the solution. Students who are in the bottom quartile are good at the basics; that is all they are good at. To move these students from their position at the bottom, teachers need to promote higher-order thinking skills for these at-risk students. Teachers can promote higher-order thinking skills in their classrooms by asking open-end questions, providing increased wait time for answers, and modeling examples of their thinking process through think-alouds and appropriate answers in their responses to the students' questions (Bell, 2003). With the development of these higher-level skills, students are better prepared to move ahead.

Distributed Curriculum

Many students who are struggling academically do not believe they can succeed because they allow themselves to be discouraged by previous failures. When they are confronted with difficult tasks, they demonstrate avoidance behaviors or become frustrated and shut down. With distributed curriculum, also known as spaced practice, students receive small increments of instruction each day without frustration. These "spaced repetitions can foster time-on-task and help students develop and sustain positive attitudes toward school and learning" (Dempster, 1991, p. 75). Most students who are

struggling don't "get it" the first time around. With the use of a distributed curriculum students are constantly revisiting previously taught material in the 5-10 instructions each day. Routinely conducting a four to five minute daily review of material is a strategy that can close the learning gaps since research shows that reviewing previously presented material increases the quantity and quality of what is learned (Bell 2003; Dempster, 1991). As a strategy used to close the learning gap, this could certainly be implemented more frequently in most classrooms (Dempster, 1991). Distributed curriculum or spaced curriculum encourages constructive mental processes involved with effort and concentration while massed practice involves superficial rote processing (Dempster, 1991). The best part of distributed curriculum for all students but especially for struggling students is the multiple opportunities to "get it." When students know they have more than one chance to learn material, they will be less likely to become anxious or frustrated. When they are relaxed, they are more likely to learn some if not all of what is needed, and if they don't get it the first time, there is always tomorrow (Dempster 1991; Everyday Mathematics 1984).

Methods

The purpose of this study is to determine if, distributed curricular instruction, also known as spaced practice, will increase the ITBS scores of the non-proficient students in math. The three methods used to collect the data for this paper were the analysis of the ITBS results of all students in grades 2-5 at Kingsley Elementary School in the years 2002, 2003, and 2004, interviews with the 4th grade teachers who taught math during the 2003-2004 school year, and a classroom action research project done

with two special education students in the resource pull out program using distributed curricular instruction of fractions.

Contextual Factors

Kingsley Elementary School is part of the Waterloo Community School District, which is made up of 21 schools: 14 elementary schools with grades K-5, 4 middle schools with grades 6-8, and three high schools. There are 10,451 students currently enrolled in Waterloo Schools, including 6,951 white students, 2,745 African American students, 570 Hispanic students, 110 Asian students and 43 Native American students. These latter four groups combine to make the 33.3% of minority students attending school in the district. There are 4,749 students receiving Title I services, and 54.88% of all the students enrolled receive free and reduced lunch. 1,544 students are identified for special education services, 423 are identified for extended learning programs, and 552 are identified for talent development in grades K-5. The average class size at the elementary level is 21 students per class with a student to certified personnel ratio of 12:1.

Kingsley Elementary School, located in an urban area of the Midwest, is a K-5 school of 326 students. There are 13 regular education teachers, four specialist teachers who teach media, music, physical education, and art. There are three special education teachers in pull out programs, two half-time and one full-time. There are also two part-time instrumental music instructors, one for orchestra and one for band. The number of students on free and reduced lunch is about 26% of the school population. Kingsley Elementary School is the only school in the Waterloo Community School District that receives no Title I funding. There are 3 kindergarten classrooms, 3 first grade

classrooms, 3 second grade classrooms, 2 third grade classrooms, one fourth grade classroom and one fifth grade classroom and two multi-age classrooms of fourth and fifth graders that stay with the same teachers for two consecutive years.

There are 326 students enrolled at the Kingsley Elementary School. 265 of those students are white, 44 are African American, 8 are Hispanic, 6 are Asian, and 1 is Native American. The majority of the families in the school have an income of \$100,000 per year and up, but there are students at the other extreme whose families receive an annual income of \$10,000 or less, and those in between. However, the number of students in the last two income brackets is considerably less than the number of students in the first income bracket.

Participants

All the students at Kingsley Elementary in grades 2-5 were used in this study as their ITBS results from fall of 2002, and 2003 were analyzed, as were the results of the ITBS test taken in the spring of 2004. Although there is some cultural diversity among the students at Kingsley Elementary School, the majority of the students are Caucasian, with the average family income ranging from the high middle to high.

The second set of participants in this study was the 4th grade teachers at Kingsley Elementary School. Three teachers at Kingsley Elementary School who taught 4th grade math in the 2003-2004 school year were interviewed. Mrs. S. has taught school for 30 years, 26 years as a 4th grade teacher and 25 of those years at Kingsley Elementary School. Mrs. W. has taught school for 6 years. The 2003-2004 school year was the first year for Mrs. W. to teach 4th grade math, which she did in a 4-5 combination classroom.

The 2003-2004 school year was also Mrs. W.'s first year at Kingsley Elementary School. Mrs. P. has taught school for 32 years. During 2003-2004 she taught in a 4-5 multi-age classroom. Mrs. P. has taught at Kingsley Elementary School for 12 years and has taught in a multi-age classroom for 8 years. She has taught 4th grade math for 8 years.

The last participants in this project are two 4th grade students who are pulled out of the regular education classroom three hours a day for instruction in reading, math, and language arts. Each of the students is classified as a level 3 student weighted at 3.74. One student is labeled as a student with autism and the other is labeled as a student with mental disabilities. Both students are considered non-proficient in all math areas according to the results of the Iowa Test of Basic Skills. Both students are academically below grade level and have difficulties with abstract math concepts. Neither student has previously had math instruction in fractions.

Instruments

Three separate methods of data collection were used to compile the information for this study. The first method of data collection was the analysis of ITBS test results. This information was used to look at the number of students who were non-proficient in math sub skills on ITBS tests and to see if students were moving from non-proficient to proficient levels. The second method of data collection was personal interviews with 4th grade teachers who taught math in the 2003-2004 school year. The interview questions were designed to determine what teachers were teaching, how they were teaching their 4th grade students and whether those instructional methods affected the outcomes for all students. The third method of data collection was an action research project done in a

resource classroom. The data collected in the action research project was to determine the effectiveness of distributed curricular instruction in improving student outcomes.

Iowa Test of Basic Skills

The first data used in this study was the results of ITBS tests. This data was used to determine the percentage of students moving from non-proficient levels to proficient levels in the math sub skills on the Iowa Test of Basic Skills. Using data from Swift Knowledge, a data storage warehouse, it was possible to compare the percentage of students at Kingsley Elementary School in grades 2-5 who were not proficient on the ITBS tests in Math Problem Solving, Math Concepts and Estimation, and Math Total without Computation from the Fall 2002, Fall 2003, and Spring 2004. The purpose of this comparison was to determine if students were moving from the non-proficient range of 40 percentile and below to the proficient range of 41 percentile and above on a standardized test given each year to all the students in the Waterloo School District. Unfortunately, this data has only been kept in the Swift Knowledge warehouse since 2002 giving only 3 testing periods for comparison. Although the comparison of these test results may show the beginnings of a trend, it is not enough to be conclusive. This data will, however, show whether students are steadily moving from the non-proficient range to the proficient range on the ITBS tests. It will also show the growth of students both individually and as a group from year to year.

Interviews

The second instrument used to collect data for this project was an individual, face-to-face interview with each of the three 4th grade teachers at Kingsley Elementary School. The interview consisted of eight predetermined questions (Appendix A) designed to elicit information about which instructional strategies were used to teach 4th grade math in the school year 2003-2004. The interviewees were given a copy of the interview questions prior to the face-to-face interviews so they could reflect on the instructional methods used the previous year. The purpose of the interviews was to find out what strategies were used in each classroom, compare the information given by the three teachers and determine if like or similar strategies were being used in each class. This data could then be used to decide if all students were receiving like or similar instruction in the same skill areas helping to determine a base of instruction for the next year. The limitations of this data are in its reflective quality. Each teacher was asked to tell what they had done in the previous year. One of the teachers was new to teaching 4th grade last year and is not teaching 4th grade this year. Although the interviews were not interrupted, they were done during the school day, and there was a limited amount of time in which to conduct the interview, thereby providing little time to go into extensive detail on some aspects of the strategies used or the reason that a particular strategy was chosen.

Classroom Action Research

The pretest, which was also used as the posttest, consisted of 12 questions covering the concepts of part and whole, fractions on a number line, volume, and

comparison of fractions. There were three questions on each concept. The students were asked to answer each question and explain their answer. The problem of the week assessment consisted of a quick check for understanding of the week's instruction. The concept for weekly assessment was determined by the Problems for Weekly Focus that was also used to determine the weekly instructional focus. The weekly assessments were usually done by asking students to answer with paper and pencil or verbally a question that was a sample of that week's instruction. Sometimes the assessment question was asked in the same way the instruction had been delivered; other times the assessment question covered the week's instructional material but was asked in a way that was different than the instructional delivery.

Procedures

Iowa Test of Basic Skills Analysis

The data for the student achievement analysis was collected by comparing the ITBS results in each grade for the year 2002, 2003, and 2004. Using the Swift Knowledge database it was possible to retrieve a list of all the students in each grade 2-5 that were not proficient in the areas of Math Problem Solving, Math Concepts and Estimation, and Math Totals Without Computation on the ITBS tests. To be able to compare the information for each test period, the list of non-proficient students in grade 2 for the fall of 2002 was generated, then that information was exported into an Excel file. Next the same information was retrieved from the Swift Knowledge database for grade 3 for the fall of 2003 testing period. This information was also exported to the Excel file so that test scores of the non-proficient students in the years 2002, 2003 and 2004 were

viewable side by side. This was done for each student in grades 2-5 for each testing period. After all the information was retrieved and exported to spreadsheets; the students who were non-proficient were divided into groups according to percentile ranking of ITBS results. The first group was 0-10 percentile, the second group was 11- 20 percentile, the third group was 21-30 percentile, and the last group was 31-40 percentile. The data was then compared to see what percentage of students were not proficient in the math sub skills of Math Estimation and Concepts, Math Problem Solving, and Math Total Without Computation, and if students were moving from the non-proficient group into the proficient group of 41 percentile and above.

Interviews

Each teacher had written some information on the questionnaire she was given before the interview. These questionnaires were collected at the end of the interview. The researcher also took notes during the interview as well as tape-recording the interviews for future study and comparison. Each interview was conducted during the school day when the teacher and interviewer had free time (usually at lunch or before or after school). Each interview lasted 20 to 30 minutes and was completed without interruption.

Classroom Action Research

The pretest was given to both students in the special education classroom. They were told that the test was just to see how much they knew about fractions. If they did not know an answer or how to do a problem they were told not to worry, but to leave the

question blank. If they were not sure how to do the problem but had an idea, they were to try the problem to the best of their ability. There was no time limit on the test.

The posttest was given at the end of the 1st quarter. The students were given the same test as they were given at the beginning of the quarter. The test was untimed as it was before. As was done the first time students were told to solve the problem and explain their answers.

Teaching Procedures

The purpose of the classroom action research was to determine if distributed curricular instruction would improve student outcomes by giving them a base of knowledge using 5-10 minutes of instruction daily in an area in which students had no previous knowledge. The limitations of this project were the limited number of students involved and the short amount of time on which the instructional value was assessed. The outcomes of this study will be used as data to determine if distributed curricular instruction might be a strategy that could be used to help improve the test scores of students below the proficient level on the math section of the ITBS tests.

For this project the 4th grade Scott Foresman/Addison Wesley math book was used as a guide to develop a modified scope and sequence. The scope and sequence was developed in four sections to match the four quarters of the school year. Each quarter was devoted to an instructional concept. The first quarter instruction was designed to cover the concept of area; the second quarter instruction was designed to cover number lines; the third quarter instruction was to develop the concept of volume; and the fourth quarter instruction was to develop the concept of the set model. After creating the scope

and sequence for developing concepts of fractions, Problems for the Weekly Focus on Fraction Concepts was created. The Problem for the Weekly focus consisted of an example problem representing the fraction instruction for that particular week. This was designed to be used as a guide for daily instruction as well as an end of the week assessment to check student understanding and mastery.

The implementation plan was to give a pre-test to determine each student's understanding of fraction concepts, give daily instruction of 5-10 minutes following the scope and sequence that was developed with the use of the current math curriculum, and to have the student do a problem each week from the Problems for the Weekly Focus as a dipstick assessment for understanding of that week's instruction.

After the pretest was given, instruction began. Instruction was administered in 10- minute increments each day. At the beginning of each instructional period, a timer was set for 10 minutes. Instruction was concluded when the timer went off; unless, it was ended earlier due to escalating frustration levels of either student. If either student became highly anxious or agitated, instruction was terminated. If the instruction was terminated early at anytime, it was noted for recorded keeping.

Results

According to the analysis of ITBS test during the Fall of 2002, 2003 and Spring of 2004 it could be concluded that students are moving from the non-proficient levels to levels of proficiency, but not all students are moving at a significant rate or are getting any closer to proficiency. Teacher interviews relate there are multiple instructional methods being used to teach math. Data shows that these strategies are working based

upon the improved student outcomes, but they are not necessarily moving all students toward proficiency nor are they necessarily the best practices for instructing students who are in need of more. The outcomes of the classroom action research, although very limited in its structure, the outcomes showed that students do make progress with this incremental instruction and that it is possible that students who are below proficiency levels may benefit significantly from this type of instruction.

Iowa Test of Basic Skills Analysis (Refer to Appendix B)

Through the collection and analysis of ITBS results it was possible to determine the number of students at Kingsley Elementary School who were not proficient in math sub-skill areas. By determining the number of students who were not proficient, it was also possible to determine the percentage of students not proficient. By comparing the results from year to year it was possible to find the percentage of students moving from non-proficient to proficient each year as is necessary to meet the dictates of No Child Left Behind.

Using data from Swift Knowledge, it was possible to compare the percentage of students at Kingsley Elementary School in grades 2-5 who were not proficient on the ITBS test in Math Problem Solving, Math Concepts and Estimation and Math Total without Computation from the Fall 2002, Fall 2003, and Spring 2004. The collected data showed in the Fall of 2002 the percentage of students not proficient in Math Concepts and Estimation was 24%. In the Fall of 2003 the percentage of students not proficient was 26% showing an increase of 2%. The percentage of students not proficient in Math Concepts and Estimation in the Spring of 2004 was 20%. This reflects a decrease in the

percentage of students not proficient in Math Concepts and Estimation of 6% from the previous Fall 2003 and an overall decrease of 4% from the Fall of 2002 to Spring 2004.

In comparing data for Math Problem Solving, the results of the ITBS test in the Fall of 2002 showed that 19% of the students in grades 2-5 at Kingsley Elementary School were not proficient in this subtest. Test results from Fall 2003 show that 23% of the students were not proficient reflecting an increase of 4% of the students. Spring 2004 tests results showed 17% of the students were not proficient in Math Problem Solving, a decrease of 5% from Fall 2003 and an overall decrease of 2% from Fall of 2002.

On the ITBS test in the Fall of 2002, 21% of the students at Kingsley Elementary School in grades 2-5 were not proficient in the subtest Math Total Without Computation. In the Fall of 2003 23% of the students tested as non-proficient showing an increase of 2%. In the Spring of 2004 18% of the students scored in the non-proficient range on the ITBS test Math total Without Computation. This showed a decrease from the Fall of 2003 scores of 5% and an overall decrease from the Fall of 2002 of 3%.

During the analysis of the Iowa Test of Basic Skills subtest in all math areas, it became apparent that although students were steadily moving from the non-proficient group to the proficient group, there were a small but significant number of students who were making little progress each year. These students' scores were nowhere near the proficient range, yet these students were not identified as needing special education services. They just appeared to score in the mid to low range of non-proficiency each year.

Interviews

The eight questions were divided into four areas of concern: curriculum, support and collaboration, instructional strategies, and goals and outcomes. In the area of curriculum each of the three teachers interviewed used a different component to guide their curricular decisions. One used discarded standards and benchmarks; one used an outdated math series, and one used math instruction developed by Marilyn Burns who wrote the book Math By All Means. The curricular decisions were based on past teaching experiences, personal preferences, student needs and what was readily available. All three teachers used student daily work to determine areas of deficiency and then addressed these particular curricular needs. Two of the teachers, who had taught 4th grade math for several years, had taught other curricula over the years and knew what 4th graders were expected to know by the end of 4th grade. This information also helped to develop curricular needs. They also acquired various resources over the years and from those resources they used what had worked best in the past and what aligned with their own teaching styles. One teacher who had no experience in teaching 4th grade relied on information she was able to find in her “inherited” materials and this information consisted of the standards and benchmarks the district had developed a few years ago but were no longer using.

Another area addressed by the interview questions was in regard to support and collaboration. In response to these questions the teachers all agreed that there was little support from the district in regards to through professional development, provision of teaching materials, curricular guidance, and resources. Since there was no district curriculum, there was no direction for teachers as to what to teach; each was left to

decide how and what to teach on their own. The lack of resources and teaching materials was limiting in regards to what the teachers taught since provision of materials and resources was often left to the teacher alone to provide. Because there was no common curriculum, the district was not providing professional development, so teachers sought professional development in math areas by what they were personally interested in and at their own expense. The teachers also agreed that collaboration was impossible since there was no common planning time for any of them. This added to the feeling of a lack of support since each 4th grade teacher felt they were making curricular and instructional decisions in isolation.

Instructional strategies were determined primarily by what the teacher was using to develop her curriculum. Student needs and available resources then became secondary influences on the choice of instructional strategies. The choice of instructional strategies ranged from a focus on mental math and developing number sense through the use of Marilyn Burns' materials, to creative problem solving using manipulatives with the emphasis on sharing how the problem was solved, to automaticity of basic math facts through repeated drill and practice. In all the classes, instruction was given both in large group and small group settings. Small groups changed as dictated by the needs of the students so that students with greater deficiency got more instructional time than those who showed greater mastery.

The teachers used the ITBS results to set their goals and their curricular focus to determine the instructional input for reaching their goals. All three teachers felt they reached their goals, and this was supported by the overall improvement in ITBS results. Although ITBS results were used for goal setting, each teacher had different goals that

matched their curricular and instructional focus. For the teacher who focused on basic facts, improvement in computation was the goal. For the teacher who focused on problem solving, the goal was improved problem solving scores on the ITBS tests. The teacher who focused on mental math and number sense set a goal for improvement in math concepts and estimation. Although there were different goals, different curricular focuses, and different instructional strategies the end result was improved student outcomes.

Classroom Action Research

On the pretest both students scored 0 out of 12 showing they had no understanding of any of the fraction concepts. Most of the questions were left unanswered, but when an answer was given it was a random number with no logical reason for the answer apparent. When one of the students attempted to answer a question, there was no attempt to explain the answer.

Daily instruction began using the scope and sequence and the problems for weekly focus. Daily instruction was given for 10 minutes each day. At the end of the week the problem for weekly focus was used to determine student mastery of the concept being taught. The assessment was done in different ways: hands on, pencil and paper, and orally.

At the end of the first week of instruction the Problem for the Weekly Focus assessment was given. Neither student was able to successfully complete the assessment. It was then decided to continue with the same instructional focus the next week rather than moving on to the next concept. The 10-minute daily instruction continued each day

on the same concept. At the end of the week the students were able to successfully complete the weekly focus assessment, which was the same assessment that was given the week before. This pattern continued throughout the quarter. The students were not able to demonstrate understanding by successfully completing the Problem for the Weekly Focus at the end of the first week of instruction, but they were able to successfully demonstrate understanding at the end of the second week by completing the Problem for the Weekly Focus when the assessment was similar to the style of instruction of the concept.

The daily instruction continued for nine weeks. Only one time in the first quarter was instruction discontinued due to student frustration allowing students to be exposed to more instruction without shutting down. At the end of the first quarter the pretest was administered as a posttest to determine whether there was an improvement in student outcomes. One of the students showed significant improvement in understanding of fraction concepts. The student was able to correctly answer all the questions related to concepts that were covered during the daily instruction. The student was also able to correctly answer two more questions on the posttest about concepts that were not covered during the daily instruction but could be solved by generalizing the knowledge acquired by previous instruction. This means the student was able to answer 6 out of the 12 questions, a 50% increase. The other student was not able to successfully answer any of the questions on the posttest that was administered in a different format than the Problem for the Weekly Focus the student had successfully completed each week. This suggested an inability to generalize the information when assessed in an unfamiliar format. On the

posttest neither student was able to explain their answers even when they were able to correctly answer the question.

Discussion

Through the analysis of ITBS math subtests of Math Total without Computation, Math Estimation and Concepts, and Math Problem Solving it was apparent there has been steady increase in the number of students moving toward proficiency. Over the period from the fall of 2002 to the spring of 2004 there was an overall decrease in the number of non-proficient students. Through the analysis of the ITBS information it also became apparent that not all students were so fortunate. These students are in the 20th to 30th percentile, and they show little or no improvement in ITBS math test scores from the fall of 2002 to the spring of 2004. The lack of improvement by these students is a serious concern.

Teacher interviews revealed a need for professional development, time for collaboration, administrative support in curricular decisions and provision of resources. Teacher related they were aware of the students who were not “getting it,” but felt they did know what else to do, proving a need for professional development. The need for collaboration is also shown through the inconsistency in curricular decisions, goals, and instructional strategies used by the different teachers.

The classroom action research project showed some student improvement when students were given small but repeated instruction over a period of time. The students who showed some progress in this study were students identified as special education students leading one to believe that regular education students who demonstrate low-test

scores over a period of time may also benefit from the use of distributed curriculum instruction.

Iowa Test of Basic Skills

While looking at the Swift Knowledge data and analyzing student movement from non-proficient levels to proficient levels it became obvious that some students were moving above the 41st percentile, but it also became apparent when data was exported to spreadsheets there was a group of students who were not making significant movement from year to year and were no nearer or only slightly nearer reaching proficiency in the third test period than they were in the first test period. It appears that these students are maintaining the same level of outcomes no matter what instructional strategies are being used at any grade level. These students are being passed from grade to grade, but are still between the 20th and 30th percentiles on ITBS results. These are the students who are being left behind.

Interviews

The result of the teacher interviews showed that teachers believe that what they are doing is what is best for all students. They know that overall student outcomes are improving and fewer students are below the non-proficient level. Although student outcomes are improving there is no plan among teachers on how best to meet the needs of students well below the proficiency level. They are focusing on moving the students who are at the 35th to 40th percentile to the proficiency level, and they are successful. But they are not able to move those other students, however. The teachers “felt” that some of their

students were not “getting it,” but they had no proof of this and no idea what to do about it. The teachers are doing the best they can instructionally without the materials, resources, professional development and collaboration needed, and when there is no set curriculum to follow. It is clear however that no matter what good intentions the teachers had and what instructional strategies did work for some, there were still students who were not getting the instructional strategies they needed in order to improve their outcomes. It was also clear through the interview responses that different teachers had different focuses, giving students peaks and valleys in their overall instructional schemas and making it difficult for 5th grade teachers to fill in gaps for students coming to them from different teachers. The need for consistent instructional strategies across grade levels was obvious as was the need for some research to determine best practice instruction for students below proficient levels, some professional development for teachers

to be able to provide best practice instruction for the students who are not moving any closer to that minimum goal of the 41st percentile, and the materials to support the instructional needs of those students.

Distributed Curriculum

The distributed curricular instruction used in the classroom action research is one strategy that could be used to improve standardized test outcomes for all students. Because this instruction is given in small doses each day students do not shut down due to frustration or anxiety allowing more instruction to be given over a period of time. The students who were involved in the classroom action research are students who are

identified as entitled to special education services. By definition in this state these students are in the bottom 10% of their class. If the distributed curriculum improved the student outcomes for these students it is reasonable to expect that the same type of instruction would improve the outcomes of other students who are not being successful with the instructional strategies currently being used in the regular classrooms.

Classroom Action Research

Instruction for the classroom action research was provided in a small group setting. It is not clear whether the small group delivery of the distributed curriculum instruction was a factor in the students' success, but in attempting to find the answer for all students this is another factor to be considered for the unsuccessful students. Not only should teachers and administrators be taking a look at the instructional strategies being used in the classroom, they also should perhaps take a look at the setting in which the instruction is delivered. For the students who are not successful with the current instructional strategies of the regular education classroom, there must be consideration for different instructional strategies, different instructional settings, and perhaps even different types of placement for these students in order for them to be successful and not be left behind.

Future research

Future research questions could investigate other instructional strategies that have proven to be the best practice instructions for students who are not successful with the present instructional strategies. Another consideration for study would be what type of

instructional setting would be most productive for those students not experiencing success in the current classroom setting. Should they be taught in smaller groups, in ability grouping or as they are now in whole group instruction for everyone? Another thought to be pursued is should these students be identified in some way similar to students who are identified for special education? Would this provide them with more instructional assistance so they would, in the end, be more successful?

No matter what decisions are made for professional development, collaboration, or instructional strategies, it is pertinent that teachers and administrators decide what to do and implement those decisions right away. With each passing year the gap widens between these students and their peers. Although the number of students who are maintaining their levels of non-proficiency are small, they are the students for which the law was written. They are the students being left behind.

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Appendices

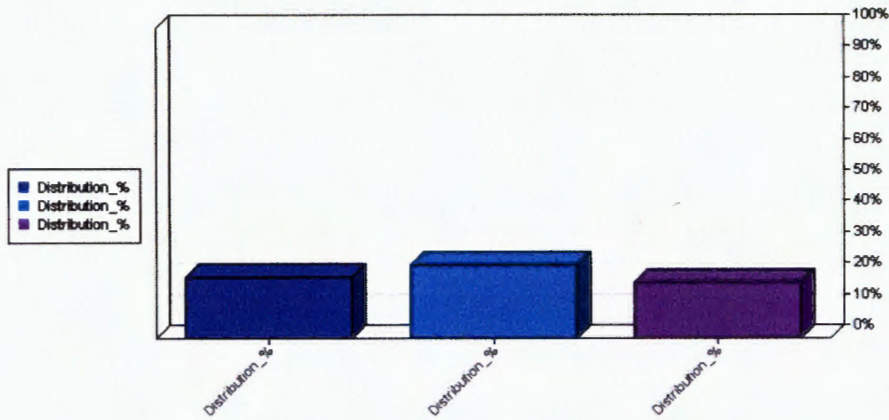
Appendix A

Interview Questions

1. What did you base your math instructional curriculum on from October 2003 to April 2004?
2. What specific strategies did you use in teaching 4th grade math last year?
3. Were you given enough support through materials, resources, and training while teaching a4th grade math last year? Why or why not?
4. Did the outcomes of the strategies meet your expectations?
5. What were your math goals for improving math scores?
6. When planning math lessons, did you collaborate with other 4th grade math teachers?
7. What strategies will you continue to use in your current teaching?
8. What future strategies will you implement or change?

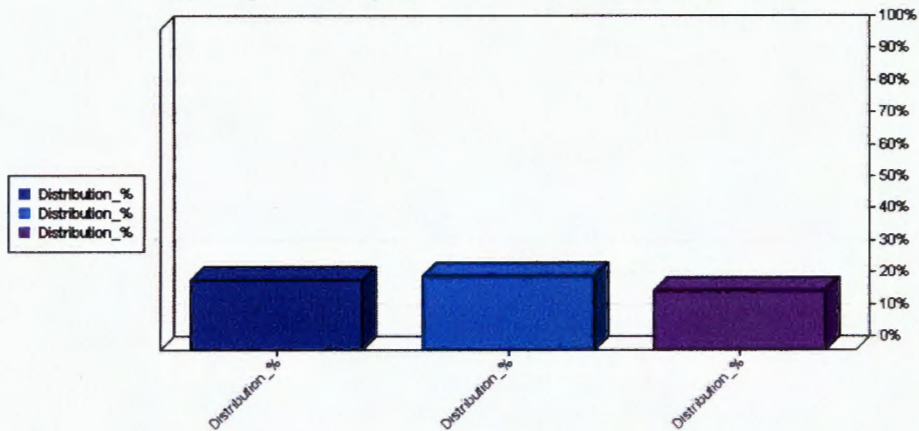
Appendix B

Students non-proficient in math problem solving 2002-2004



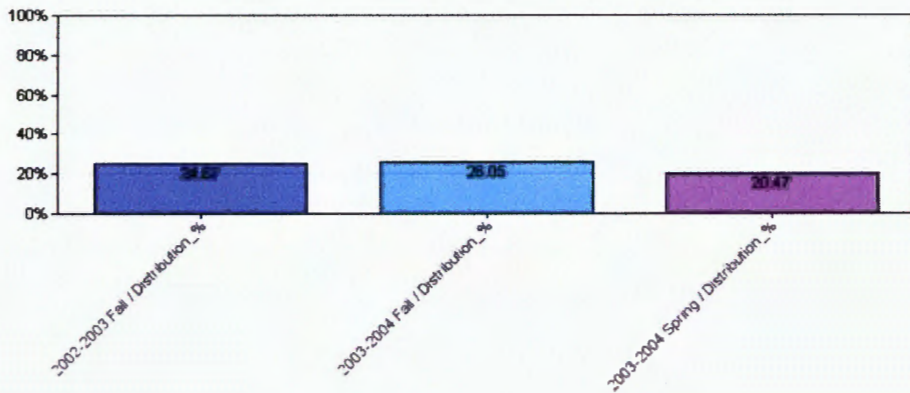
Kingsley Elementary - Monday, April 25, 2005

Percentage of students not proficient in math total without computation



Kingsley Elementary - Monday, April 25, 2005

students not proficient in math concepts and estimation 02-04



Kingsley Elementary - Monday, April 25, 2005